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| 10/761,613 | 01/21/2004 | King Jien Chui | CS03-050 | 3506 |

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| EXAMINER |
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GARCIA, JOANNIE A

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| ART UNIT | PAPER NUMBER |
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2823

DATE MAILED: 03/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/761,613

Applicant(s)

CHUI ET AL.

Examiner

Joannie A. García

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 November 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) 28-35 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,7,8,12-15,18-21 and 23-25 is/are rejected.
- 7) ☒ Claim(s) 3-6,9-11,16,17,22,26 and 27 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 20040121.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____.

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Applicant's election with traverse of claims 1-27, Group II, in the reply filed on 11-15-04 is acknowledged. The traversal is on the ground(s) that the searches are the same, and because of issues related to compact prosecution and public interest. This is not found persuasive because valid reasons for restriction have been stated and applicant does not address these reasons for restriction.

The requirement is still deemed proper and is therefore made FINAL.

The disclosure is objected to because of the following informalities: On page 10, line 2, "step is" after "These order of these" should be replaced with --steps are--. On page 12, line 4, "figure 1" after "as shown", should be replaced with figure --3A--. On page 14, line 9, "an" before "second type impurity", should be replaced with --a--.

Appropriate correction is required.

Claims 1-27 are objected to because of the following informalities:

In claim 1, line 4, "region implantation" after "doped depletion", should be replaced with --implantation region--.

Claim 1 recites the limitation "second conductive type" in lines 4-5. There is insufficient antecedent basis for this limitation in the claim.

Claim 1 recites the limitation "source/drain regions" in line 6. There is insufficient antecedent basis for this limitation in the claim.

In claim 1, line 6, "source/drain regions;" should be followed by --and--.

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In claim 1, line 7, “a” before “second conductivity type”, should be replaced with --said--

In claim 1, line 8, “S/D regions” should be preceded by --said--.

In claim 1, line 9, “have” before “an impurity concentration”, should be replaced with having--.

In claim 2, line 1, “doped depletion region” should be preceded by --said--.

In claim 2, line 1, “are” after “doped depletion region” should be replaced with --is--.

In claims 3 and 4, line 1, “have a” after “doped depletions regions”, should be replaced with --having an--.

Claims 3 and 4, recite the limitation "built-in junction" in line 2. There is insufficient antecedent basis for this limitation in the claim.

In claims 5 and 6, lines 1 and 3, respectively, “a” before “first impurity type” should be replaced with --said--.

Claim 7 recites the limitation "region of said substrate" in line 1. There is insufficient antecedent basis for this limitation in the claim.

In claims 9-11, line 2, “a” before “second type” should be replaced with --said--.

In claims 12 and 13, line 1, “conductive” after “first” should be replaced with --conductivity--.

In claim 13, line 2, “100 has a As or P” before “concentration between”, should be replaced with --has an--.

In claims 18 and 19, line 1, “region implantation” after “doped depletion”, should be replaced with --implantation region--.

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In claims 18 and 19, line 2, “does” after “ions at a”, should be replaced with --dose--.

In claims 18 and 19, line 3, “has” after “said doped depletion region” should be replaced with --having--.

Claims 18 and 19, recite the limitation "substrate surface" in line 4. There is insufficient antecedent basis for this limitation in the claim.

In claims 20 and 21, line 3, “have” after “source/drain regions”, should be replaced with -having--.

In claim 20, line 3, “Source/drain” before “regions”, should be replaced with --source/drain--.

Claim 20 recites the limitation "substrate surface" in lines 3-4. There is insufficient antecedent basis for this limitation in the claim.

Claim 21 recites the limitation "substrate surface" in line 4. There is insufficient antecedent basis for this limitation in the claim.

Claim 22 recites the limitation "sidewalls of said gate structure" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim.

In claim 23, line 2, “on” before “substrate”, should be replaced with --a--.

In claim 23, line 4, “region implantation” after “doped depletion”, should be replaced with --implantation region--.

Claim 23 recites the limitation "second conductive type" in lines 4-5. There is insufficient antecedent basis for this limitation in the claim.

In claim 23, line 5, “conductive” should be replaced with --conductivity--.

Claim 23 recites the limitation "source/drain regions" in line 6. There is insufficient antecedent basis for this limitation in the claim.

In claim 23, line 11, "a" before "impurity concentration", should be replaced with --an--.

Claim 23 recites the limitation "built-in junction potential" in lines 11-12. There is insufficient antecedent basis for this limitation in the claim.

In claim 23, line 18, "a" before "second conductivity type" should be replaced with --said--.

In claim 24, line 1, "doped depletion region" should be preceded by --said--.

In claim 24, line 1, "are" after "doped depletion region", should be replaced with --is--.

Claim 25 recites the limitation "region of said substrate" in line 1. There is insufficient antecedent basis for this limitation in the claim.

In claim 25, line 2, "a" before "first type impurity", should be replaced with --said--.

Claim 26 recites the limitation "sidewalls of said gate structure" in lines 1-2. There is insufficient antecedent basis for this limitation in the claim.

Claim 27 recites the limitation "sidewalls of said gate structure" in line 2. There is insufficient antecedent basis for this limitation in the claim.

In claim 27, line 2, "region implantation" after "doped depletion", should be replaced with --implantation region--.

Appropriate correction is required.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 7, 8, and 14, are rejected under 35 U.S.C. 102(b) as being anticipated by Burr (US 2003/0178698 A1).

Burr discloses forming a gate structure 704 over a silicon substrate 706 being doped with a first conductivity type impurity such as p-type with a concentration of 1×10^{17} atom/cc (Figure 7A, and Paragraphs 0024, 0096, and 0161), forming a channel region under said gate structure with a concentration of 1×10^{17} atom/cc (Figure 7A, and Paragraph 0096), performing a doped depletion implantation region 770 by implanting ions being a second conductivity type to the substrate to form doped depletion regions beneath and separated from source/drain regions 703/705 (Figure 7A, and Paragraphs 0161, and 0164), wherein said doped depletion region is not formed under said gate structure and said doped depletion regions are fully depleted (Figure 7A), and performing a s/d implant by implanting ions having the second conductivity type into the substrate to form the source/drain regions adjacent to said gate structure (Figure 7A, and Paragraph 0161), said doped depletion regions having an impurity concentration and thickness so that said doped depletion regions are depleted due to a built-in potential created between said doped depletion regions and said substrate (Figure 7A).

Claims 12, 13, 15, 18-21, and 23-25, are rejected under 35 U.S.C. 103(a) as being unpatentable over Burr as applied to claims 1, 2, 7, 8, and 14, above, and further in view of Bae et al (US 20040075143 A1).

Burr discloses performing either p-type or n-type processes (Paragraph 0200). Burr does not teach using boron as a p-type dopant, nor using arsenic or phosphorous as an n-type dopant. Bae et al discloses using boron as a p-type dopant, and arsenic or phosphorous as an n-type dopant. It would have been within the scope of ordinary skill in the art to combine the teachings of Burr and Bae et al, to form doped substrate 706 of Burr to be performed, by employing the either of the dopants disclosed by Bae et al.

Burr discloses the claimed invention except for a channel width between 0.04 and 0.5 μm , a boron and a phosphorous or arsenic dose for the doped depletion implantation region between $5 \times 10^{11} \text{ atoms/cm}^2$ to $5 \times 10^{13} \text{ atoms/cm}^2$, an energy for the doped depletion region between 50 keV to 500 keV, a depth below a substrate surface for the doped depletion implantation region of 0.09 μm to 0.7 μm , a boron and a phosphorous or arsenic dose for the s/d implant between $5 \times 10^{14} \text{ atoms/cm}^2$ to $5 \times 10^{16} \text{ atoms/cm}^2$, an energy for the s/d implant between 50 keV to 80 keV, a depth below a substrate surface for the s/d implant of 0.04 μm to 0.5 μm . It would have been obvious to one having ordinary skill in the art at the time the invention was made to determine a suitable channel width, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

In addition, the selection of a suitable channel width, dose, energy, and depth, is obvious because it is a matter of determining optimum process conditions by routine experimentation with a limited number of species of result effective variables. These claims are prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40

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USPQ2d 1685, 1688 (Fed. Cir. 1996)(claimed ranges or a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill or art) and *In re Aller*, 105 USPQ 233 (CCPA 1995) (selection of optimum ranges within prior art general conditions is obvious).

Note that the specification contains no disclosure of either the critical nature of the claimed channel widths, doses, energies, and depths, or any unexpected results arising therefrom. Where patentability it's said to be based upon particular chosen channel widths, doses, energies, and depths, or upon another variable recited in a claim, the Applicant must show that the chosen channel widths, doses, energies, and depths, are critical. *In re Woodruf*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Claims 3-6, 9-11, 16, 17, 22, 26, and 27, would be allowable if rewritten to overcome the objection(s) set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joannie García whose telephone number is (571) 272-1861. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

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supervisor, Olik Chaudhuri, can be reached on (571) 272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



George Fourson
Primary Examiner
Art Unit 2823



JAG
March 9, 2005

GFourson
Primary Examiner